Risk Factors for Nocturia in Taiwanese Women Aged 20–59 Years

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SUMMARY

Objective: To assess the risk factors for nocturia among Taiwanese women aged 20–59 years.

Materials and Methods: A random sample of 4,549 women aged 20–59 years was selected by multistage sampling. A total of 3,537 women were interviewed face-to-face by well-trained interviewers and local public health nurses. The definition of lower urinary tract symptoms used is that as defined by the International Continence Society. Variables of sociodemography, medical histories, obstetric and gynecologic histories, and lower urinary tract symptoms were recorded. The factors were assessed by frequency and logistic regression analyses using a significance level of less than 0.05.

Results: The prevalence of nocturia increased significantly with age ($p < 0.001$), body mass index ($p < 0.001$), diabetes mellitus ($p = 0.024$), hypertension ($p = 0.001$), previous gynecologic operation ($p = 0.003$), drug allergy ($p = 0.036$), and marital status ($p = 0.000$). However, there was no relationship between nocturia and smoking, alcohol consumption, parity, hysterectomy, menopause or hormone therapy.

Conclusion: Although the answers to the etiology of nocturia are still not all known, nocturia has been associated with various factors, suggesting that multiple approaches are necessary in the treatment of patients with nocturia. [*Taiwan J Obstet Gynecol* 2007;46(2):166–170]

Key Words: lower urinary tract symptoms, nocturia, prevalence, risk factors of nocturia, Taiwanese women

Introduction

The Standardization Sub-committee of the International Continence Society defined nocturia as "waking at night one or more times to void" [1]. This applies to any number of voids during the night, but this definition does not provide the criteria as to when nocturia becomes a problem for women. Nocturia is associated with aging, and it has now been recognized as a symptom of urinary disorders of multifactorial origin. It can result from behavioral and environmental factors, such as late-night fluid intake, tea and coffee consumption, or from several clinical conditions, such as diabetes mellitus (DM), cardiovascular disease, overactive bladder, anxiety, and primary sleep disorders [2,3].

Nocturia is considered a main cause of disturbance of sleep maintenance for women 50 years or older [4]. The prevalence of nocturia was reported to range from 6.5% to 95% in women [5–9]. The prevalence in Taiwanese women aged 20–59 years was 26.4%, which was reported previously [10]. In the same report, the researchers also showed a significantly high risk for developing nocturia in Taiwanese women with increasing age. However, to our knowledge, very few researchers have investigated the risk factors for nocturia. In this study, we attempted to reveal the risk factors of nocturia in the female population aged 20–59 years, using data collected from a sample based on a multistage random sampling method.

Nocturia can lead to a reduction in productivity in affected women who spend more time off work, and

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to a deterioration in their general state of health [11]. From the point of view of public health, it is important to identify the risk factors of nocturia that might impair the quality of life of the sufferers. This will allow for the provision of lifestyle behavior modification of women at risk or for treatment of the underlying risk factors, which will be helpful in preventing and treating nocturia.

Materials and Methods

The study was conducted in Taiwan, including the main island and the small islands within the sovereign territory. In 1998, there were an estimated 5.9 million women between the ages of 20 and 59 years living in Taiwan; 4,549 women within this age group were selected for a multistage random sample design study. The study was part of the eighth nationwide survey of Taiwanese people concerning the knowledge, attitude and practices on family and fertility conducted by the National Institute of Family Planning (NIFP) of the Department of Heath, Executive Yuan, Taiwan.

A total of 3,537 women were successfully interviewed by well-trained professional NIFP interviewers within 3 months after selection. The study was fully explained to the participants. The questionnaire was devised to cover five areas: general background, medical history, obstetric and gynecologic history, nocturia, and other lower urinary tract symptoms. Nocturia was considered to be present when a respondent answered "one time" or "more than one time" to the question at all "How many times do you wake up to void during the night after falling asleep?" Interviewees who did not answer this question at all were excluded from the study. Analysis of the individual items was based only on the number of subjects for who answered those particular questions.

All data were entered into a computer database and analyzed using SAS (SAS Institute, Cary, NC, USA). The χ^2 test was used to test for differences in the percentage of nocturia among patients with different dichotomous explanatory variables. Logistic regression was used to investigate the relationship between nocturia and ordinal explanatory variables. A p value less than 0.05 was regarded as statistically significant.

Results

There were 1,012 women selected who could not be contacted or refused the interview, producing a response rate of 77.8% (3,537/4,549). There were 16 interviewees who missed the question on nocturia and were excluded from this study.

Table 1 shows that the prevalence of nocturia significantly increased in subjects with a history of DM, hypertension (HT), previous gynecologic operation, drug allergy or marriage. The body mass index (BMI) in 62.4% (2,034/3,259) of the women was between 18.5 and 24 which was within the normal range for the ideal body weight in Taiwan (Table 2). In addition, it was

Table 1. Prevalence of nocturia by medical histories and marital status in 3,521 women

Group	Nocturia, *n* (%)	Number of interviewees missing*	Pearson's χ^2	Degrees of freedom	*p*
Diabetes mellitus		13	5.084	1	0.024
Yes	29/77 (37.7)				
No	899/3,431 (26.2)				
Hypertension		14	11.614	1	0.001
Yes	75/205 (36.6)				
No	851/3,302 (25.8)				
Gynecologic operation		78	9.087	1	0.003
Yes	81/230 (35.2)				
No	839/3,213 (26.1)				
Drug allergy		35	4.379	1	0.036
Yes	102/325 (31.4)				
No	822/3,161 (26.0)				
Married		0	41.688	1	0.000
Yes	809/2,802 (28.9)				
No	122/719 (17.0)				

**Number of the 3,521 interviewees missing in each group.*

obvious that BMI was one of the identified risk factors of nocturia in Taiwanese women aged 20–59 years.

Table 3 shows that smoking, alcohol consumption, hysterectomy, childbirth, menopause and hormone therapy did not increase the risk of nocturia in subjects in this study. Table 4 shows that there was no relationship between nocturia and parity.

Discussion

Nocturia affects the patient's well-being in a negative way, and it correlates with poor health [5]. Studies that include an assessment of nocturia find that it is a common and bothersome complaint [12], and it is often regarded as the most troublesome of all lower urinary tract symptoms [13]. Thus, it would be beneficial to identify the risk factors associated with the development of nocturia in Taiwanese women.

Similar to the results which Liew et al [14] and van Dijk et al [15] showed in Singapore and the Netherlands, respectively, our study revealed that nocturia was positively associated with poor health. Women who suffered from DM and HT had nocturia significantly more often than those who did not. Yoshimura et al also reported that HT and DM were independent positive risk factors for nocturia [16].

Both the report of Middelkoop et al [4] and that of our previous study [10] showed that the prevalence of nocturia increased with successive decades of age.

Table 2. Prevalence of nocturia by body mass index in 3,259 women*

Group	Nocturia, *n* (%)	Pearson's χ^2	Degrees of freedom	*p*
BMI < 18.5	74/351 (21.1)			
18.5 ≤ BMI < 24	498/2,034 (24.5)			
24 ≤ BMI < 27	193/602 (32.1)			
27 ≤ BMI < 30	48/192 (25.0)	31.063	5	0.000
30 ≤ BMI < 35	32/75 (42.7)			
BMI ≥ 35	0/5 (0)			
Total	845/3,259 (25.9)			

**Of the 3,521 interviewees, 262 women were missing.*

Table 3. Prevalence of nocturia by smoking and other behaviors in 3,521 women

Group	Nocturia, *n* (%)	Number of interviewees missing*	Pearson's χ^2	Degrees of freedom	*p*
Smoking		38	2.682	1	0.101
Yes	32/154 (20.8)				
No	890/3,329 (26.7)				
Alcohol consumption		53	0.002	1	0.969
Yes	61/228 (26.8)				
No	863/2,377 (26.6)				
Hysterectomy		3,435	0.837	1	0.360
Yes	26/61 (42.6)				
No	8/25 (32.0)				
Childbirth		24	0.369	1	0.544
Yes	703/2,629 (26.7)				
No	223/868 (25.7)				
Menopause		33	1.721	1	0.190
Yes	213/751 (28.4)				
No	711/2,737 (26.0)				
Hormone therapy		3,024	0.021	1	0.885
Yes	19/74 (25.7)				
No	112/423 (26.5)				

**Number of the 3,521 interviewees missing in each group.*

Table 4. Prevalence of nocturia by parity in 3,497 women*

	Parity									Pearson's χ^2	Degrees of freedom	*p*
	0	1	2	3	4	5	6	7	8			
Nocturia, *n* (%)	223/868 (25.7)	95/350 (27.1)	242/893 (27.1)	227/830 (27.3)	96/356 (27.0)	31/135 (23.0)	9/48 (18.8)	2/15 (13.3)	1/2 (50.0)	5.129	8	0.744

**Of the 3,521 interviewees, 24 women were missing.*

In addition, the majority of the reports in the literature about the prevalence of nocturia showed that it significantly correlated with age [14–17].

In addition to DM, HT and age, our current study also revealed that a history of previous gynecologic operation, drug allergy (the types of drugs were not known) and marriage, and elevated BMI all positively increased the risk of nocturia in women. However, to our knowledge, no researchers have previously reported these risk factors for nocturia. The findings need further investigation.

This study revealed that smoking was not a risk factor for nocturia. Even though fewer current smokers (32/154; 20.8%), when compared with non-smokers (890/3,329; 26.7%), had to wake up at night to void, the difference was not statistically significant. Similar to the results of this survey, Yoshimura et al reported that current smokers who smoked 20 or more cigarettes per day were less likely to have nocturia than non-smokers [16].

Whether a woman had given birth or not or the number of children she had did not increase the prevalence of nocturia. Similarly, it was true for those with a history of hysterectomy. Although the women who underwent hysterectomies had a higher rate of nocturia than those who did not (42.6% *vs.* 32.0%), the difference was not statistically significant. Moreover, alcohol consumption, menopause and hormone use were not risk factors for nocturia.

Nocturia is highly prevalent even in well-functioning older women. The large number of risk factors for nocturia suggests that there may be a range of different etiologies for nocturia, and thus a number of preventive strategies may be needed. From a public health point of view, it is important to promote better health education in order to identify the risk factors of nocturia, to be aware of the symptoms of nocturia, and to seek available mainstream treatment to promote quality of life, and prevent accidents at night.

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